

# Document made available under the Patent Cooperation Treaty (PCT)

International application number: PCT/BE05/000013

International filing date: 02 February 2005 (02.02.2005)

Document type: Certified copy of priority document

Document details: Country/Office: GB  
Number: 0402255.4  
Filing date: 03 February 2004 (03.02.2004)

Date of receipt at the International Bureau: 07 March 2005 (07.03.2005)

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b)



World Intellectual Property Organization (WIPO) - Geneva, Switzerland  
Organisation Mondiale de la Propriété Intellectuelle (OMPI) - Genève, Suisse



INVESTOR IN PEOPLE

The Patent Office  
 Concept House  
 Cardiff Road  
 Newport  
 South Wales  
 NP10 8QQ

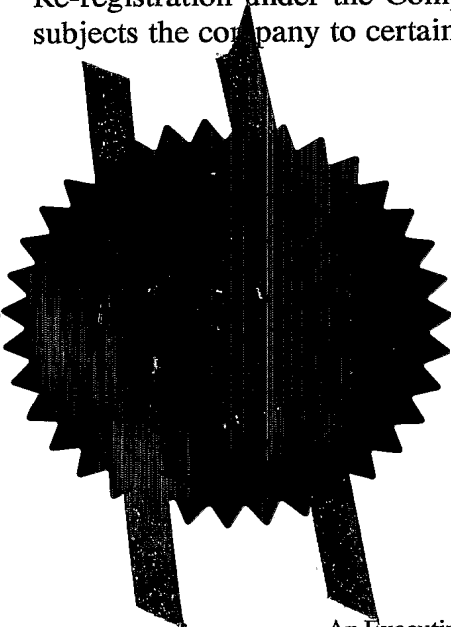
I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

I also certify that the attached copy of the request for grant of a Patent (Form 1/77) bears an amendment, effected by this office, following a request by the applicant and agreed to by the Comptroller-General.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

In accordance with the rules, the words "public limited company" may be replaced by p.l.c., plc, P.L.C. or PLC.

Re-registration under the Companies Act does not constitute a new legal entity but merely subjects the company to certain additional company law rules.



Signed *[Signature]*

Dated 4 February 2005

Patents Form 1/77

Patents Act 1977  
(Rule 16)

THE PATENT OFFICE  
CF  
- 3 FEB 2004  
RECEIVED BY FAX



03FEB04 E870072-2.D00247  
P01/7700 0.00-0402255.4 ACCOUNT CHA

**Request for grant of a patent**

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office

Cardiff Road  
Newport  
South Wales  
NP10 8QQ

## 1. Your reference

04403 GB

## 2. Patent application number

(The Patent Office will fill in this part)

0402255.4

3. Full name, address and postcode of the or of each applicant (underline all surnames)

Hansen Transmissions International NV

Leonardo da Vincilaan 1

B-2650 Edegem

Antwerp

Belgium

Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

Roller Bearings

## 5. Name of your agent (if you have one)

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

Mr J R Badger

Invensys Intellectual Property

P O Box 8433

Redditch, B98 0DW

United Kingdom

JR Badger & Co  
6 Simpson Road  
Wyle Green  
Sutton Coldfield  
West Midlands

Patents ADP number (if you know it)

Country

Priority application number  
(if you know it)Date of filing  
(day / month / year)

## 6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

## 7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing  
(day / month / year)

## 8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

YES

- a) any applicant named in part 3 is not an inventor, or  
b) there is an inventor who is not named as an applicant, or  
c) any named applicant is a corporate body.  
See note (d))

Patents Form 1/77

## Patents Form 1/77

9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form	0
Description	3
Claim(s)	0
Abstract	0
Drawing(s)	1 only

10. If you are also filing any of the following, state how many against each item.

Priority documents	0
Translations of priority documents	0
Statement of inventorship and right to grant of a patent (Patents Form 7/77)	0
Request for preliminary examination and search (Patents Form 9/77)	0
Request for substantive examination (Patents Form 10/77)	0
Any other documents (please specify)	0

11.

I/We request the grant of a patent on the basis of this application.

Signature

P.H. Coory

Date

3/2/04

12. Name and daytime telephone number of person to contact in the United Kingdom

J R Badger

01527 838264

**Warning**

After an application for a patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you live in the United Kingdom, Section 23 of the Patents Act 1977 stops you from applying for a patent abroad without first getting written permission from the Patent Office unless an application has been filed at least 6 weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked.

**Notes**

- a) If you need help to fill in this form or you have any questions, please contact the Patent Office on 08459 500505.
- b) Write your answers in capital letters using black ink or you may type them.
- c) If there is not enough space for all the relevant details on any part of this form, please continue on a separate sheet of paper and write "see continuation sheet" in the relevant part(s). Any continuation sheet should be attached to this form.
- d) If you have answered 'Yes' Patents Form 7/77 will need to be filed.
- e) Once you have filled in the form you must remember to sign and date it.
- f) For details of the fee and ways to pay please contact the Patent Office.

Patents Form 1/77

## ROLLER BEARINGS

This invention relates to roller bearings and in particular, though not exclusively, to a roller bearing for use in applications, such as in the gear units of wind turbines, in which skidding or sliding occurs between the roller and raceway (bearing) surfaces.

When the rotational speed of rollers in a roller bearing is insufficient to ensure pure rolling in the raceways, skidding could occur between the roller and raceway surfaces. Rollers typically decelerate in the unloaded zone of the bearing and are accelerated by the raceways in the loaded zone. The force needed to accelerate the rollers is, among others, dependant on the speed difference between the roller and raceway surfaces and the roller inertia. Prolonged skidding can cause material smearing and bearing failure.

When bearings run under low-or no-load conditions, the loaded zone becomes very small or does not exist, meaning that relative sliding between the roller and-raceway surfaces is likely to occur. Should load suddenly be applied to the bearing where the relative surface speeds of the rollers and raceways is high, smearing of material could occur as the rollers are accelerated.

In wind turbines, these conditions can often be found on the high speed and intermediate shafts of speed multiplication Gear Units. Turbulence in the wind can cause drastic load changes on the gear unit and cause rollers to decelerate during low-load and accelerate again when the load increases. During coast down of the wind turbine, the torque direction on the shafts can often reverse, leading to a shift in the loaded zone position and roller skidding.

In accordance with one aspect of the present invention there is provided a roller bearing comprising a plurality of bearing rollers located radially between inner and outer bearing surfaces, said bearing surfaces being rotatable one relative to the other about the rotational axis of the bearing, and said bearing comprising biasing means which provides a force in a radial direction relative to the axis of rotation of the bearing to ensure that under all load conditions for which the bearing is designed for use each

bearing roller is retained in contact with each of said inner and outer bearing surfaces.

The bearing surfaces may be provided by inner and outer bearing rings in conventional manner, or one or each of said bearing surfaces may be defined by the surface of another component in an integrated type construction in which said other component performs an additional function.

The radial biasing effect may be provided by the or each bearing roller per se, or may be provided by additional element, for example a deformable element secured relative to one of the bearing surfaces. Additionally or alternatively it is envisaged that a biasing force may be provided by a bearing surface, for example by virtue of a part of a bearing surface being of a non-cylindrical shape when in an unstressed condition, and deformable slightly towards a cylindrical shape when acted upon by a bearing roller located between the confronting bearing surfaces.

The invention is of particular applicability to a roller bearing in which the bearing rollers are of the cylindrical type, but may be employed also for bearings comprising taper type bearing rollers.

Embodiments of the present invention are now described, by way of example only, with reference to the accompanying drawings.

The teaching of the invention is one embodiment is to introduce an elastic element(s) between the raceways and the rollers that ensures contact between these elements at all times. In Figure 1, various methods of achieving this are shown. Figure 1 (a) depicts a section of a cylindrical roller bearing with outer ring [1], roller [2] and inner ring [3]. The inner ring raceway is machined in such a way as to have a zone(s) that protrude above the normal working surface of the raceway. In this zone(s) the radial stiffness of the inner ring is reduced by, for instance, the removal of a ring of material as shown in Figure 1. When the bearing is assembled, the protruding lip(s) will be deformed and cause the rollers to be pushed against the outer raceway. The amount that the lip should protrude above the normal raceway surface will be a function of, among others, the amount of radial clearance in the bearing, the operating speed and the roller inertia.

## 3

Figure 1 (b) shows a variation on the same theme. Here the radial spring(s) takes the form of a compress-able element [4] that is inserted in the outer ring of the bearing. It could be placed in the corners of the outer ring (as shown in Figure 1 (b) ) or in the middle of the ring , as in Figure 1 (c). The ring could be manufactured using an engineering elastomer.

In Figure 1 (d) the rollers are modified to create a zone(s) acting as a spring and ensuring contact between roller and raceways. Here, again, the principle is the same. The surface of the roller is machined in such a way as to cause the roller surface to protrude slightly above the normal roller surface in the low stiffness zone(s).

All of the executions shown will cause a reduction in load bearing capacity because of the fact that the load carried by the low stiffness zones will be insignificant. Such bearings could thus be more expensive when compared to standard bearings, but will have the advantage of resisting slip phenomena, which is in many cases, the root cause of ultimate bearing failure.

1 / 1

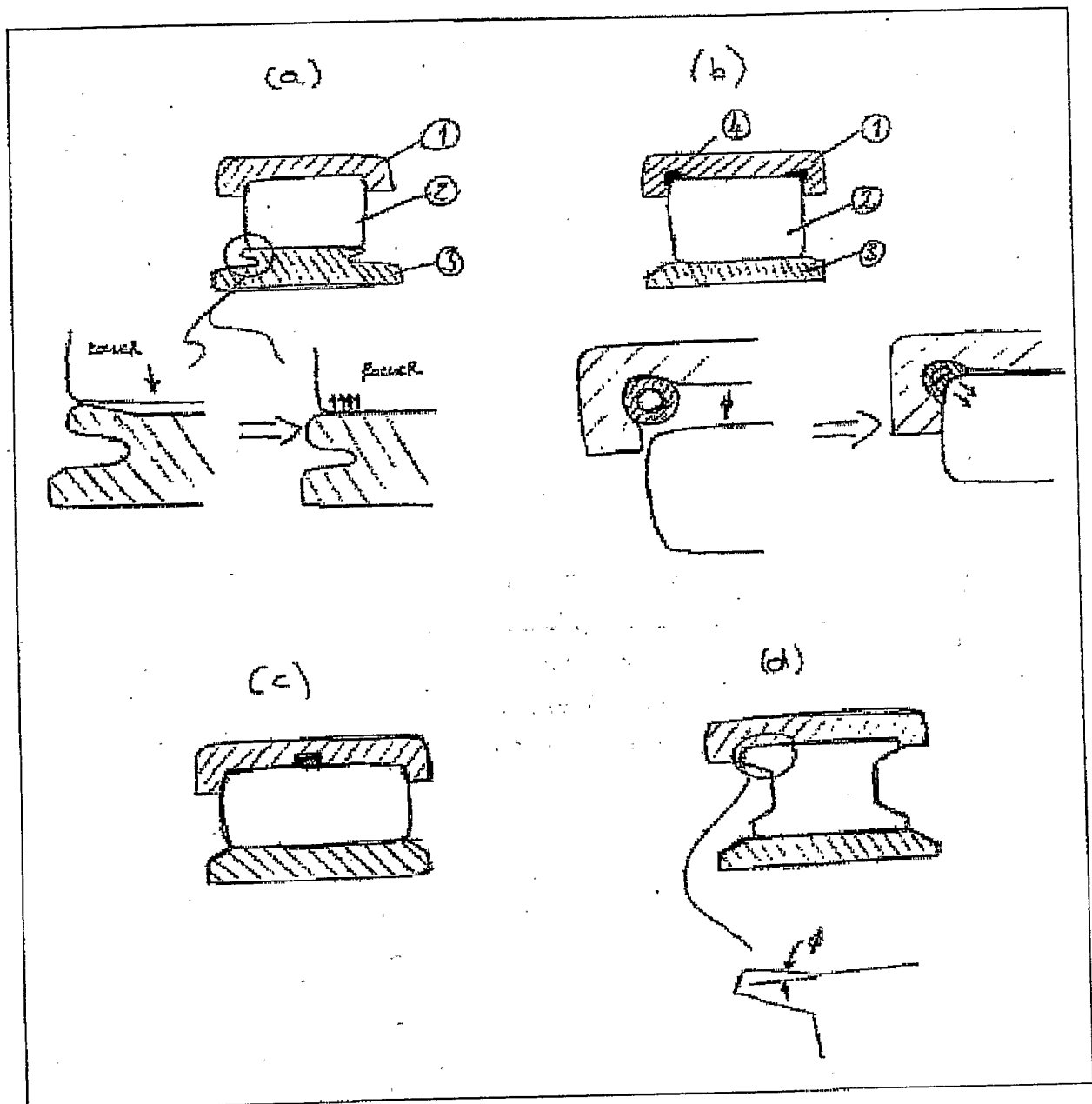


FIGURE 1